Claims

1. A method of treating diabetes in a subject in need thereof, said method comprising the steps of:

a) providing one or more cells capable of producing insulin or one or more cells capable of producing progeny cells that produce insulin;

b) transducing said cells with a nucleic acid sequence encoding an IAP polypeptide, wherein said nucleic acid sequence is positioned for expression in said cells, and wherein expression of said IAP polypeptide increases survival of said cells relative to untreated control cells; and

c) transplanting said cells from step b) into said subject, wherein said transplanting results in the production of insulin by said cells in an amount sufficient to treat diabetes in said subject.

2. The method of claim 1, wherein said transducing of step b) is performed *ex vivo*.

3. The method of claim 1 or 2, wherein, in said transducing step b), said cells are transduced with a viral vector.

4. The method of claim 3, wherein said viral vector is selected from the group consisting of an adenoviral vector, an adeno-associated virus, a lentiviral vector, and a herpes viral vector.

5. The method of any one of claims 1-4, wherein said nucleic acid sequence is operably linked to a constitutive promoter that directs expression of said nucleic acid sequence in said cells.

6. The method of claim 5, wherein said promoter is selected from the group consisting of the insulin promoter, the CMV promoter, the SV-40 promoter, and the chicken actin promoter.

7. The method of claim 6, wherein said insulin promoter is a human insulin promoter.

8. The method of any one of claims 1-7, wherein said nucleic acid sequence is operably linked to a regulatable promoter that directs expression of said nucleic acid sequence in said cell.

9. The method of any one of claims 1-8, wherein said subject is a human.

10. The method of any one of claims 1-9, wherein said diabetes is type 1 diabetes.

11. The method of any one of claims 1-10, wherein said nucleic acid sequence is selected from the group consisting of *xiap*, *hiap-1*, *hiap-2*, *m-xiap*, *m-hiap-1*, or *m-hiap-2*.

12. The method of any one of claims 1-11, wherein said IAP polypeptide comprises at least one BIR domain and has caspase-inhibiting activity.

13. The method of claim 12, wherein said IAP polypeptide comprises two BIR domains.

14. The method of any one of claims 1-13, wherein said cells comprise pancreatic beta islet cells.

15. The method of any one of claims 1-14, wherein said cells comprise cells selected from adult stem cells or embryonic stem cells capable of differentiating to insulin-producing cells.

16. The method of any one of claims 1-15, wherein said cells are isogeneic cells.

17. The method of any one of claims 1-16, wherein said cells are allogeneic cells.

18. The method of any one of claims 1-17, wherein said cells are xenogeneic cells.

19. The method of claim 18, wherein said xenogeneic cells are isolated from a pig, a sheep, or a baboon.

20. The method of claim 18, wherein said xenogeneic cells are derived from an animal genetically engineered such that said cells have increased survival in a recipient following transplantation, relative to a cell derived from an animal which has not been genetically engineered.

21. The method of any one of claims 1-20, wherein said transplanting step c) comprises transplanting said cells into the pancreas, the liver, or the kidney of said subject.

22. The method of claim 21, wherein said transplanting step c) comprises transplanting said cells into the kidney capsule of said kidney.

23. The method of any one of claims 1-22, wherein said increase in survival of said transplanted cells is at least 20%, relative to the survival of untreated control cells.

24. The method of claim 1, wherein at least 50% of said transplanted cells survive in said subject for two months.

25. The method of claim 24, wherein at least 50% of said transplanted cells survive in said subject for one year.

26. The method of claim 25, wherein at least 50% of said transplanted cells survive in said subject for five years.

27. A method of treating diabetes in a subject in need thereof, said method comprising the steps of:

(a) providing one or more cells that are capable of producing insulin or one or more cells capable of producing progeny cells that produce insulin, wherein said cells expresses a heterologous nucleic acid encoding an IAP polypeptide, and wherein said IAP polypeptide is capable of inhibiting apoptosis of said cells; and

(b) transplanting said cells, wherein upon transplantation of said cells into said subject said cells produce insulin in an amount sufficient to treat diabetes in said subject.

28. The method of claim 27, wherein said polypeptide further comprises at least one BIR domain and has caspase-inhibitory activity.

29. The method of claim 28, wherein said IAP polypeptide comprises two BIR domains.

30. The method of any one of claims 27-29, wherein said IAP gene is *xiap*, *hiap-1*, *hiap-2*, *m-xiap*, *m-hiap-1*, or *m-hiap-2*.

31. The method of any one of claims 27-30, wherein expression of said IAP polypeptide in said cells promotes survival of said cells.

32. The method of any one of claims 27-31, wherein said heterologous nucleic acid encoding an IAP polypeptide is provided to said cells using a viral vector.

33. The method of claim 32, wherein said viral vector is selected from the group consisting of an adenoviral vector, an adeno-associated virus, a lentiviral vector, and a herpes viral vector.

34. The method of any one of claims 27-33, wherein said nucleic acid sequence is operably linked to a constitutive promoter that directs expression of said nucleic acid sequence in said cell.

35. The method of claim 34, wherein said promoter is selected from the group consisting of the insulin promoter, the CMV promoter, the SV-40 promoter, and the actin promoter.

36. The method of claim 35, wherein said insulin promoter is a human insulin promoter.

37. The method of any one of claims 27-33, wherein said nucleic acid sequence is operably linked to a regulatable promoter that directs expression of said transgene in said cell.

38. The method of any one of claims 27-37, wherein said diabetes is type 1 diabetes.

39. The method of any one of claims 27-38, wherein said subject is a human.

40. The method of any one of claims 27-39, wherein said cells are isogeneic cells.

41. The method of any one of claims 27-40, wherein said cells are allogeneic cells.

42. The method of any one of claims 27-41, wherein said cells are xenogeneic cells.

43. The method of claim 42, wherein said xenogeneic cells are isolated from pig, sheep, or baboon cells.

44. The method of claim 42, wherein said xenogeneic cells are derived from a recombinantly engineered animal for transplantation into humans.

45. The method of any one of claims 27-44, wherein said cells comprise pancreatic beta islet cell.

46. The method of any one of claims 27-45, wherein said cells comprise cells selected from adult stem cells or embryonic stem cells, wherein said adult stem cells and said embryonic stem cells capable of differentiating to insulin-producing cells.

47. The method of any one of claims 27-46, wherein said transplanting step b) comprises transplanting said cells into the pancreas, the liver, or the kidney of said subject.

48. The method of claim 47, wherein said transplanting step b) comprises transplanting said cells into the kidney capsule of said kidney.

49. The method of any one of claims 27-48, wherein said cells encapsulated prior to said transplanting.

50. The method of any one of claims 27, wherein said increase in survival of said cells is at least 20%, relative to the survival of untreated control cells.

51. The method of any one of claims 50, wherein at least 50% of said transplanted cells survive in said subject for two months.

52. The method of claim 51, wherein said at least 50% of said transplanted cells survive for one year.

53. The method of claim 52, wherein said at least 50% of said transplanted cells survive for five years.

54. The method of any one of claims 1-53, wherein said method further comprises administering an immunosuppressive agent to said patient.

55. The method of claim 54, wherein said immunosuppressive agent is selected from the group consisting of cyclosporin, cyclophosphamide, prednisone, dexamethasone, methotrexate, azathioprine, mycophenolate, thalidomide, FK-506, sirolimus, tacrolimus, daclizumab, and systemic steroids.

56. The method of any one of claims 1-55, wherein said method further comprises administering an anti-apoptotic agent to said patient in an apoptosis-inhibiting amount.

57. A method of treating diabetes in a subject in need thereof, said method comprising the steps of:

(a) providing one or more cells capable of producing insulin or one or more cells capable of creating progeny cells that produce insulin;

(b) contacting said cells with an anti-apoptotic agent in an amount sufficient to inhibit apoptosis of said cells; and

(c) transplanting said cells, wherein upon transplantation of said cells into said subject said cells produce insulin in an amount sufficient to treat diabetes in said subject.

58. A method for enhancing the survival of one or more cells capable of producing insulin or one or more cells capable of creating progeny cells that produce insulin, said method comprising providing said cells with a heterologous nucleic acid sequence encoding an IAP polypeptide, wherein expression of said IAP polypeptide enhances the survival of said cells relative to control cells.

59. The method of claim 58, wherein expression of said IAP polypeptide enhances the survival of said cells by one week.

60. The method of claim 59, wherein expression of said IAP polypeptide enhances the survival of said cells by three months.

61. The method of claim 60, wherein expression of said IAP polypeptide enhances the survival of said cells by one year.

62. A method of treating diabetes in a subject in need thereof, said method comprising the steps of:

a) providing one or more cadaveric beta islet cells capable of producing insulin;

b) transducing said cells with a recombinant adenovirus comprising a heterologous nucleic acid sequence encoding a human XIAP polypeptide, wherein said nucleic acid sequence is positioned for expression in said cells, and wherein expression of said IAP polypeptide increases the survival of said cells, relative to an untreated control cell, by inhibiting apoptosis of said cells; and

c) transplanting said cells from step b) into said subject, wherein said cells produce insulin in an amount sufficient to treat diabetes in said subject.

63. Use of a cell capable of producing insulin or capable of producing progeny cells that produce insulin for the manufacture of a medicament for the treatment of diabetes, wherein said cell is transduced with a nucleic acid sequence encoding an IAP polypeptide, said nucleic acid sequence positioned for expression in said cell, and wherein expression of said IAP polypeptide increases survival of said cell relative to an untreated control cell.